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An Analysis of the Differential Test of Spelling Ability

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AN ANALYSIS OF THE DIFFERENTIAL TEST OF SPELLING ABILITY

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by

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PREFACE

The following pages contain a statistical evaluation of The Differential Test of Spelling Ability constructed by the staff of The Reading Laboratory, University of Omaha.

The major hypothesis of this instrument is that a person's spelling disability may be in any one or all four areas of spelling dynamics. This test was constructed under the supposition that it is possible to discriminate between the four types of spelling ability in which the student may be deficient. The data obtained from the test results as to the student's disability, if any, may be used to tutor him in his deficient areas.

The purpose of the present evaluation is to determine whether the instrument does or does not discriminate between the four assumed types of spelling disability. The purpose of the test is to provide a basis for differential treatment of the spelling disabilities among college and high school students.

At this time I would like to acknowledge Dr. Larry Johnston and Staff, Reading Laboratory, University of Omaha without whose efforts and supervision this study would not have been possible.

CHAPTER I

THE HISTORY, PROBLEM, AND DEFINITIONS OF TERMS USED

For many years there has been considerable interest expressed in the area of spelling with respect to reading difficulties. Numerous spelling scales have been developed to measure a person's ability to spell a certain number of words of increasing difficulty. Yet there has not been constructed a specific spelling test which attempts to assist the student in finding out why he is not spelling correctly. Thus the test The Differential Test of Spelling Ability, attempts to determine the areas of disability by separating spelling ability into four different types of function.

I. THE HISTORY

The difficulties and inconsistencies of English spelling have long been recognized. The same sound may be spelled in a number of different ways, and the same letter or combination of letters may stand for a number of different sounds. The words of the English language have come from a variety of sources and reflect the influences of the orthography of the languages from which they originate. The history of the language discloses other factors which also help to explain the vagaries of

modern English spelling: changes in the pronunciation of many words; the development and persistence of dialects; the indifference of early writers and printers to consistency in spelling; and the diverse principles of orthography that have been advocated from time to time.

The publication of glossaries, and later the publication of dictionaries, did much to standardize the spelling of words. Most of the words in dictionaries published after 1700 are spelled as they are today. Attempts to attain a more rational orthography have continued to be made up to the present day. Benjamin Franklin in 1768 made extensive recommendations for simplifying English spelling, and Noah Webster introduced many new spellings.[1] In 1898 the National Education Association recommended the simplified spelling of twelve words, believing that if attention were centered on a few words the probability of getting the simplified forms accepted would be greater. In 1906 the Simplified Spelling Board was formed.[2]

In the popular mind simplified spelling is often assumed to mean that words should be spelled as the sound.

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[1] Smyth, A. H., The Writings of Benjamin Franklin. New York: Macmillian Publishing Co., 1907, pp. 169-70.

[2] Marckwardt, A. L., The American Language. New York: Knopf and Co., 1937, Chs. VII and VIII.

Phonetic spelling would require a radical reform of the alphabet as well as the standardization of pronunciation.

Since the publication in 1913 of M. F. Jones's Concrete Investigation of the Material of English Spelling[3] a large number of investigations have been made of the writing vocabulary of children. Since Jones and other early investigators did not report the frequencies for the words in their lists, their data are of very limited usefulness. Later investigations have had their frequencies tabulated but in only a few extensive studies have frequencies been published. Among the more extensive investigators Rinsland, Fitzgerald, Ashbaugh, McKee, Dillion, Wheeler, and Smith[4] have made important contributions.

Among the most important functions served by tests in spelling are : (a) to show individual differences in spelling ability in the class and hence to enable the teacher to make proper adjustments to these differences; (b) to show which words each pupil needs to study; (c) to guide learning by depicting its successes and failures; (d) to show what progress has been made during a term or year. No one test can serve all these ends; each test

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[3] Jones, M. F., Concrete Investigation of the Material of English Spelling. South Dakota: University of South Dakota Press, 1915, p. 31.

[4] Monroe, W. S., Encyclopedia of Educational Research. New York: Macmillan Publishing Co., 1950, p. 1230.

must be constructed and administered according to the purpose for which it is to be used.[5]

L. P. Ayres constructed A Measuring Scale for Ability in Spelling[6], which was published in 1915. His scale was widely used, particularly in school surveys, for measuring spelling ability and achievement. In the next few years several similar scales were constructed, the best-known of which are the Sixteen Spelling Scales, the Love Spelling Scales, and the Buckingham Extension of the Ayres Spelling Scale[7]. More recently, standardized tests in spelling have been included in batteries of achievement tests, such as the Metropolitan Achievement Tests, the Stanford Achievement Tests.[8]

Tests constructed for teaching purposes fall into three main groups: (a) tests used for the classification of students and for the measurement of their progress during a term, (b) those used to guide the learning of any assignment unit, (c) those used for special diagnostic purposes.[9]

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[5] Ibid., p. 1259

[6] Ayres, L. P., A Measuring Scale for Ability in Spelling. New York: Russell Sage Publishing Foundation, 1915, p. 5.

[7] Buckingham, B. R., The Buckingham Extension of the Ayres Spelling Scale. New York: Russell Sage Publishing Foundation, 1913, pp. 14-23.

[8] Allen, R. D. and Others, Metropolitan Achievement Tests. New York: World Book Co. Inc., 1940.

[9] Horn, Ernest, The Classroom Teacher. Chicago: The Classroom Teacher, Inc., 1927, p. 451-70.

Considerable attention has recently been given to the measurement of spelling ability as contrasted with the ability to spell words that have been studied systematically in the spelling class. It seems likely that spelling ability may be indicated to some extent by the present spelling tests and scales. It is now commonly recognized, however, that the measurement of spelling ability requires attention to the basic factors that determine this ability. While promising beginnings have been made in discovering and defining these factors, the results are as yet fragmentary and somewhat inconclusive.[10]

II. THE PROBLEM

Statement of the problem. A person's spelling disability can not be completely and adequately measured by tests that are only concerned with his ability to spell words of increasing difficulty. Thus The Differential Test of Spelling Ability is assumed to meet this need of determining the reasons why a person is not spelling correctly above and beyond the measurement of word difficulty. This test separates spelling ability into four different types of spelling dynamics.

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[10] Monroe, W. S., Encyclopedia of Educational Research. New York: Macmillan Publishing Co., 1950, p. 1260.

It was the purpose of this study to evaluate statistically the degree to which The Differential Test of Spelling Ability would discriminate between four hypothesized types of spelling ability. Thus the scope was (a) to determine if the subtest scores differed significantly enough to sustain the hypothesis that a person might have one or more elements of disability; (b) to determine if the subjects' scores differed significantly on the four subtests; and (c) to identify the significant relationships between the variances of the four subtests.

Importance of the study. As stated above, there have been numerous spelling scales constructed to measure a person's ability to spell according to word difficulty, among them The Wide Range Achievement Test[11] and The Morrison-McCall Spelling Scale.[12]

The Differential Test of Spelling Ability has as its purpose the measurement of four hypothesized types of spelling ability. It is therefore not a measurement of the range of a person's spelling ability with respect to word difficulty. It is hypothesized that four such types of

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[11] Jastak, Joseph, The Wide Range Achievement Test. Wilmington: C. L. Story Co., 1946, p. 3.

[12] Morrison, J. Cayce, and William McCall, The Morrison-McCall Spelling Scale. Chicago: World Book Company, 1925, p. 1.

spelling ability are operative in spelling dynamics. With the data obtained from The Differential Test of Spelling Ability attention may be focused upon the types of disability found in the subjects, with the purpose of correcting them by training and tutoring. It is hoped that this study may contribute important data toward the developing of a new concept in spelling and the understanding of how spelling ability can and may be objectively measured.

II. DEFINITIONS OF TERMS USED.

Visual memory. This is a term employed to imply the retaining of a visual stimulus by the subject. A stimulus such as a nonsense word on a card is presented to the subject. He is immediately required to reproduce in writing the nonsense word as it was presented to him. Thus the term "visual memory" means the remembering of a stimulus that has been presented visually.

Word demons. These are usually words that can not be spell~~ed~~ phonetically. An individual must learn how to spell a word demon and remember it. Such words as "seize," "embarrass," and "equipped" fall into this category.

Phonetic (analysis). This term refers to the process of breaking a word down into its component parts by sounding out the syllables. This is accomplished by

separating the component parts of a word into understandable sounds. For example, "If c-o-r-n spells the word 'corn', how do you spell the nonsense word 'yorn' ?"

Structural (analysis). For the purpose of this study, "structural analysis" is used to mean the addition of known prefixes and suffixes to word roots. An example of a test question demonstrating "structural" usage might be a follows: "if the letters g-a-m spell "gam", how do you spell the nonsense word 'exgam' ?" Thus the prefix "ex" is attached to the base nonsense word "gam".

III. DEFINITIONS OF SUBTEST OBJECTIVES

Subtest of visual memory. This subtest involves the presentation of a group of cards containing "selected" nonsense words. The staff of the Reading Laboratory, University of Omaha, was responsible for the research, compilation, and organization of the data that compose the following subtests.

The subtest contains twenty-five items. The items were presented to the experimental group in order of length of word. This does not necessarily imply word difficulty level. For the statistical analysis a table of random numbers was employed to randomize the twenty-five items which were originally ranked. The items were ranked according to number of letters per word for presentation to the experimental group.

Stevens Handbook of Experimental Psychology[13], p. 545, Table 9, was consulted for the nonsense word combinations. The major objective in the composition of the nonsense words were (a) to not combine two vowels, (b) if possible not to combine two consonants, and (c) not to repeat the same letter in any single nonsense word. An example that item emphasizing these three objectives might be the nonsense word "ZUB". However, several nonsense words had two consonants together to avoid combining two vowels, e.g., the nonsense word "JOFNELM".

A table of random numbers was employed to select the individual letter combinations extracted from Stevens' Handbook of Experimental Psychology[14] for each word.

Cards were prepared for the presentation of these words to the experimental group. Each card was 5^{n} x 2^{n} in size no matter what the length of the individual nonsense word happened to be. Thus, the nonsense test words "KOH" and "BOFNELM" were inscribed on the same size card and centered on the card for equality of visibility.

Each card was exposed to the experimental group for

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[13] Stevens, S. S., Handbook of experimental psychology. New York: John Wiley & Sons Inc., 1951, p. 545.

[14] Ibid.

exactly three seconds. This task was preceded by a stop watch. The objective of the test was to note if the subjects were able to continue to demonstrate their ability to visually perceive and then write a different stimulus, of the same character, that increased in length (hypothesized discretely). The reasons for each task was exactly three seconds.

Therefore, this test is hypothesized to measure the subject's ability to perceive (read) stimuli which increase in difficulty (length), and retain their contents. If the subject was able to reproduce (write) the stimulus in its entire correct order he was given credit for that item (test item).

Subtest for phonetic analysis. This subtest involved the presentation of a group of phonetic nonsense words. These nonsense words were auditorized orally to the experimental group, members of which were required to reproduce (write) the words correctly spelled. The thirty-six items that required the subject were left in their own random order of presentation for the statistical analysis. Table 3 in Dykstra's Analysis of Prereading Skills[15] was used to obtain the letter combinations for each item. The nonsense word item "baf", for example, was read the

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[15]Dykstra, p. 544.

table reported in Table 1. The mean test time difference between the two three-letter nonsense words. The ranking of three-letter nonsense words into the lower nonsense words was accomplished by the use of random selection of three letter combinations.

The subject is exposed to twenty-five nonsense words based on phonetic combination. This test is hypothesized to measure the subjects ability to carry out the correct spelling of a word presented to him orally.

Subject by treatment analysis. This subtest involved the presentation of a group of related nonsense words to the experimental group. The staff of the Learning Laboratory at the University of Utah was responsible for the research, compilation, and organization of the data that support this subtest.

The subject receives twenty-five items. The items were presented to the experimental group in three orders; index was an advance, an the remaining words at the length and/or discredit level.

An example of a test item that would be in the word "house". If the letters presented the letters were "hous", how do you spell the nonsense word "house"? The principle of simple subtraction is applied by the addition of this nonsense word, in that the subject

is required to attach the suffix "ness" to the base of the nonsense word "bers". Another example of a test item from this subtest would be the nonsense word "ringen". "If the letters g-e-m spell the nonsense word 'gem', how do you spell the nonsense word 'ringen'"? The principle of prefix attachment is sampled by the spelling of this nonsense word.

This subtest is hypothesized to measure the subjects ability to demonstrate his usage of prefix and suffix attachment in spelling. To be given the "base" of a word and then to attach the appropriate suffix or prefix is hypothesized to sample the individual's ability to attach correctly prefixes and suffixes.

Subtest for word demons. This subtest involved the presentation of "selected" word demons to the experimental group. The subtest contains twenty-five items. The items were presented to the experimental group in random order; there was no ordering of the words as to length, meaning, and/or difficulty level.

As stated in Section II of Chapter I, word demons are words which are usually not spellable by the rules of phonetics. That is, the subject must know how to spell a word demon from prior learning. An example of a word demon for this subtest is the word "criticism". This is a word

which is not considered to be spellable through phonetic theory.

This subtest is hypothesized to measure the subject's ability to spell words correctly that he must recall from memory.

III. CONSIDERATIONS FOR THE SUBTESTS

A listing of the four subtests may be studied in Table 1, page 14. This is a table listing the subtests with the twenty-five items in each. This list is arranged according to the random order used for the statistical analysis (analysis of variance).

The four subtests comprise one hundred items, giving each an equal weight in the overall scale.

TABLE I

SUBTEST ITEMS

Word Demons	Visual Memory	Structural Analysis	Phonetic Analysis
1 - Seize	1 - Suymi	1 - Progam	1 - Baf
2 - Schedule	2 - Feqsozv	2 - Regam	2 - Dat
3 - Psychology	3 - Bzal	3 - Engam	3 - Sug
4 - Whether	4 - Kuwzah	4 - Game	4 - Wug
5 - Sophomore	5 - Qivte	5 - Gamned	5 - Diffet, Diffit
6 - Ninety	6 - Bofrimej	6 - Gamning	6 - Dattal
7 - Opportunity	7 - Movith	7 - Gammer	7 - Tammel
8 - Conscience	8 - Ihxu	8 - gammeat	8 - Durab
9 - Laboratory	9 - Ruy	9 - Gamful	9 - Famet
10 - Mathematics	10 - Xamzejti	10 - Gamless	10 - Fabe, Faib
11 - Recommend	11 - Qenk	11 - Gamness	11 - Hame, Haim
12 - Equipped	12 - Ihoaqtov	12 - Bames	12 - Mabe, Maib
13 - Possess	13 - Bejxidkuw	13 - Baned	13 - Gafe, Gaif
14 - Original	14 - Ouhtofax	14 - Baming	14 - Meep, Meap
15 - Occasion	15 - Xuh	15 - Bamer	15 - Neeb, Neab
16 - Noticeable	16 - Kecfupl	16 - Bawest	16 - Feem, Fean
17 - Excellent	17 - Bupvo	17 - Bamely	17 - Deat, Deat
18 - Embarrass	18 - Bexzurj	18 - Bameful	18 - Lote, Loat
19 - Criticism	19 - Vohee	19 - Bameless	19 - Hobe, Hoab
20 - Argument	20 - Weeqxov	20 - Bameness	20 - Dobe, Doab
21 - Appearance	21 - Kefja	21 - Nongam	21 - Rab
22 - Immediately	22 - Cojmaf	22 - Diagam	22 - Thab
23 - Familiar	23 - Fiwveb	23 - Congam	23 - Trame
24 - All right	24 - Tijxews	24 - Exgam	24 - Slame
25 - Divine	25 - Xemqug	25 - Miegam	25 - Steme

CHAPTER II

ADMINISTRATIVE INSTRUCTIONS FOR PRESENTATION OF SUBTEST ITEMS AND THEIR DEVELOPMENTAL HISTORIES

1. ADMINISTRATIVE INSTRUCTIONS FOR THE PRESENTATION OF SUBTEST ITEMS

Subtest for visual memory. After the experimental group had been assembled for the administration of the Differential Test of Spelling Ability, the following statements were made:

> Introduction.
> We are asking you to participate in an experiment. Your instructor has kindly given up the class hour for this purpose. Since English 109 classes have as one of their objectives the raising of their members' spelling ability, we are asking you to take part in this experiment to assist us in determining what skills constitute (or to make up) 'good' spelling ability.

Paper and pencils were issued to each student, and they were asked to divide the page into four columns, numbering each from one to twenty-five.

An example card of a three-letter nonsence word was shown to the group, and the following instructions were given:

> This is a three letter nonsense word. I am going to ask you to look at several cards with nonsense words on them, and I want to write the word you see on the paper handed to you.

> This example nonsense word is spelled KUJ. Each nonsense word will be shown to you for three seconds. I will ask for your attention before each card is shown to you. For example, the card will be shown to you for three seconds [illegible] will be asked to write the nonsense word on your page. Please do not begin to write before the card is turned over and the nonsense word is taken from your view. I will now give you a sample nonsense word.

The card (Card KUJ) is held with its back facing the group. The card is exposed for three seconds (time to be kept by a stop watch). The card is then turned over.

> Now write the word in the upper left hand margin of your page. You should have written the nonsense word KUJ.
>
> Will you please write the next word across from number one on your page.

The twenty-five cards were presented to the experimental group. Several questions were asked after the presentation of the cards, none of which merit mention here.

Subtest for kinetic analysis. The administrative instructions for the presentation of the subtest items were prepared for the most part by the staff of the Reading Laboratory, University of Omaha. A few modifications were made in the original instructions by the writer for the purpose of clarity and ease of administration.

> Introduction.
>
> The next portion of the experiment will also be composed of twenty-five nonsense words. This

portion of the experiment is to measure a person's ability to spell words phonetically. This means the ability to hear a word pronounced and then spell it correctly by 'sounding out' the component syllables. For example, we may take the word 'apeman'. The first syllable of this word emphasizes the principle in which the 'a' has a l-o-n-g sound. This syllable is 'ape-'. The second syllable is 'man'. This word is then syllabicated (broken up) as follows: 'ape-man'.

Thus the following words will emphasize principles of syllabication (breaking words up into their respective syllables). The first group of words will emphasize a short 'a'. The first word is the nonsense word 'baf' . . . the second word is 'dat' . . . etc.

The reader may note that word five and words ten through word twenty on this subtest have two correct spellings. Refer to table 1, page 14, for a listing of the items in the subtest of phonetic analysis. For example, the nonsense word "diffif" (number 5) may also be spelled correctly as "diffit". The nonsense word "fake" (number 10) may also be spelled correctly as "fait". The phonetic speller may be considered correct if he spells these words either of the two ways, since both are phonetically correct.

The twenty-five items for the subtest of Phonetic Analysis follow the procedure cited above. Of particular note is the emphasis that should be placed by the administrator on correct pronunciation of these nonsense words.

Several practice sessions should be enacted by the administrator before he attempts to administer the subtest to a group. A phonetically spelled word which is incorrectly pronounced by the administrator will probably cause incorrect spelling by the group. The importance of correct pronunciation for standardized procedure in administration of this subtest can not be over-emphasized.

Subtest for structural analysis. The instructions for this subtest read as follows:

> Introduction
>
> The third portion of the experiment will be concerned with the attachment of prefixes and suffixes to nonsense words. This is to say that the 'base' of a word will be given to you and you will be asked to attach the appropriate prefix or suffix. For an example of a prefix attachment to a nonsense word: If the letters "v-a-t" spell the nonsense word "vat", how do you spell the nonsense word "nonvat"? Write the nonsense word "nonvat" in the upper left hand corner of your page.
>
> Now for a nonsense word which illustrates the principle of suffix attachment. If the letters l-a-m-f-u-l spell the nonsense word "lamful"? Write the nonsense word "lamful" under the nonsense word "nonvat" in the upper left corner of your page. Thus you see the base word 'lam' with the added suffix (ending) 'ful' spells the nonsense word "lamful".
>
> We shall now begin the third portion of the experiment.

Subtest for word demons. The administrative instructions for the presentation of the subtest items were prepared for the most part by the staff of the Reading

Laboratory, University of Omaha. The instructions for this subtest read as follows:

> Introduction
>
> The final segment of the experiment will emphasize 'word demons'. Word demons are words in our language that cannot be spelled phonetically (i.e., by sounding out the individual syllables of each word); these words a person must know how to spell correctly from previous training and/or learning. Those next twenty five words will be words that you must have learned previously in order to spell them correctly. You may be able to sound out some portions (syllables) of the words phonetically, but it is best to attempt to remember their correct letter order without using phonetics. To sound out these words phonetically may cause you to lose the correct order of the letters in each word. That the term 'word demon' means words which cause most people some difficulty in correct spelling.

Comments on administration procedures in the subtests. It can readily be observed that the procedures for the administration of the subtest item fall into a somewhat standard pattern. Each subtest has its specific element of emphasis; phonetic analysis emphasizes correct pronunciation by the administrator; the subtest of structural analysis emphasizes the presentation of understandable instruction for the attachment of prefixes and suffixes by the administrator to the subjects.

II. DEVELOPMENT HISTORY OF THE SUBTEST ITEMS

Subtest for visual memory. As stated earlier, this subtest contains twenty-five items. Each item is a non-

sense word on a 5" x 24" card (refer to Table 1, page 14).

Three nonsense words increase in length throughout the subtest. The first item is the nonsense word "zeb". This is a nonsense word emphasizing the basic principles cited in Chapter I, page 9. The last nonsense word in this subtest is the word "bufrimoj", which is constructed of three three-letter word combinations. Each letter combination is a vowel with a consonant on each end, viz., Buf-Rim-Moj. A table of random numbers was employed to randomize the items selected from Table 9 in Stevens' Handbook of Experimental Psychology[1]. Table 9 is a listing of nonsense three-letter nonsense word combinations with a low level associative value. The random numbers were employed to select the various nonsense words of three letters or more. The associative relationship within the word is as low as can possibly be obtained with a randomized procedure of this nature. A nonsense word that would have a high associative value between the three-letter combinations would be a word such as 'dogent'. Here we have two three-letter word combinations with a vowel in each and a consonant in each, viz., "dog" and "ent". This word is readily seen to have a high within associative value, i.e., the word "dog" and the word "ent". The purpose in construction of the subtest of visual memory

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[1]Stevens, op. cit., p. 545

was to avoid any such coupling together of high within associative value words.

Subtest for phonetic analysis. As stated above, this subtest contains twenty-five items. The nonsense words were arranged in random order for presentation to the group. These words were presented orally, and the subjects were required to write the words in their correct order to receive credit. The primary reference source for construction of these subtest items was Gates' "Study Exercises in Reading". This source was selected because of its emphasis on evaluation of "new word" construction. Chapter IV, "Word Analysis as the First Stage of Progress", presents the procedure for analysis of words spelled phonetically.

This reference sets forth the procedures for syllabication, vowel and consonant combinations, and identifying phonetic elements in inflection endings. As the aim of being repetitious, caution should be made of the importance of correct and understandable pronunciation with respect to the subtest items. For example, the twenty-third word in this subtest is "thab". If the 'th' sound is not clearly pronounced the subjects may be in-

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[1] Gates, Arthur I. Improvement of Reading. Revised Edition. New York: The Macmillan Co., 1947; pp. 67-69, 93-103, 145-146.

clined to spell this nonsense word as "tuV". The items that compose the subtest of phonetic analysis are entered in Table 1, page 14.

Subtest for structural analysis. This subtest also contains twenty-five items. The nonsense words were arranged in random order for presentation to the experimental group. These words were presented orally and the subjects were required to write the words in their entire correct order to receive credit. The reference for the construction of these test items was Southside Kits for Remedial Reading[3]. This test deals with the attachment of prefixes and suffixes. The root words "gaf" and "brap" were selected for the geometrical illustrations of prefix and suffix attachment. The prefixes for the nonsense words here were taken from the above cited work, pp. 15-17, as were the suffixes, pp. 15-5. The important emphasis in this subtest, then, is placing the key, the understandable instructions for the attachment of prefixes and suffixes. The administrator should familiarize himself with these principles of attachment.

Subtest for word drama. This subtest contains twenty-five items. Each is a selected word drama. The

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[3] Bettyan, William, Southside Kits for Remedial Reading. St. Louis: Webster Publishing Company, 1963.

twenty-five word demons were randomly listed for presentation to the experimental group. Refer to Table 1, page 14, for a listing of the three that comprise this instrument.

Three different listings of word demons were used to select the final items that compose the instrument. The principle sources for these words are as follows: 231 Most Spelling Demons for High School Students,[4] 331 Most Spelling Demons for College Students[5] and Ninety-eight Spelling Demons for High School and College Students.[6]

Sixty-five word demons were finally selected as being the most representative of the lists previous. The procedure for selection was as follows: Since all three lists are considered to be test criterion, a word that appeared on all three was considered to have maximum reliable value. A word that to appear on all three lists however it was considered for entry in the overall list. Sixty-five words appeared on all three lists, and these remained for the selected items.

These sixty-five words were then arranged in random order for presentation. Each word was put into an understandable sentence for presentation to the experimental group. For example, the word demon "one" was given in

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[4]Fernsee, B. L., "231 Most Spelling Demons for College Students," College English, vol. 20, March, 1959, pp. 293-95.

[5]Boyd, G. A., "331 Most Spelling Demons for High School Students," English Journal, Vol. 47, May, 1958, pp. 267-70.

[6]Fernsee, B. L., and G. A. Boyd, "Ninety-eight Spelling Demons for High School and College Students," Educational Administration and Supervision, vol. 44, November, 1958, pp. 335-6.

the following sentence: "There is too much noise in the room." The correct usage of the word "too" has to be known by the subject in order for him to spell it correctly. The spelling of "too" as "to" or "two" is obviously incorrect. Thus a word demon samples a person's previous learning with respect to words that can not be spelled phonetically. The word "too" can not be spelled phonetically, and must be known from prior learning.

CHAPTER III

STATISTICAL ANALYSIS OF THE SUBTESTS AND THE FINDINGS

I. DIVISION WITHIN THE SUBTEST

There were twenty-five items in each of the four subtests. The subtests were divided into five parts with five items in each. The purpose of the division was to make possible the statistical analysis. The five scores for each subject on each subtest are to be found in the appendix. The entries in Table I, page 26, are the total scores obtained on each subtest by each subject. Variances were computed for each subject in each of the four subtests. This data may be studied in Table II, page 27.

II. TESTING FOR THE HOMOGENEITY OF VARIANCE

The F table for two way classification analysis of variance is shown in Table III, page 28. The values for treatments among subtests, subjects, interaction, and within blocks may be studied in this table.

Bartlett's Test of Homogeneity of Variance was computed. This was because the statistic B' has a sampling distribution that approaches that of chi square and may be interpreted safely as chi square except when it

TABLE Ia

INDIVIDUAL TOTAL SCORES FOR EACH SUBTEST[a]

	SUBTESTS				
Subjects	WD[b]	VM[c]	SA[d]	PA[e]	TOTAL
1	15	23	17	20	75
2	20	17	11	18	66
3	16	21	13	17	67
4	14	11	13	11	58
5	9	18	13	10	43
6	21	22	18	15	72
7	8	18	18	21	69
8	10	18	10	11	48
9	14	19	23	20	71
10	10	14	13	19	65
11	17	17	15	13	52
12	21	18	14	8	56
13	15	25	13	12	64
14	11	16	14	16	70
15	21	24	14	15	56
16	12	14	21	10	76
17	8	16	19	17	62
18	8	19	20	12	56
19	16	14	17	14	62
20	15	13	17	15	55
Total	275	264	314	294	1247

[a]The maximum score possible on each subtest is 25.
[b]Word Demons
[c]Visual Memory
[d]Structural Analysis
[e]Phonetic Analysis

TABLE II

VARIANCES AMONG SUBTESTS FOR EACH SUBJECT

Subjects	WD[a]	VM[b]	SA[c]	PA[d]
1	.50	.30	1.30	1.00
2	1.00	.30	3.70	1.30
3	.20	1.70	2.80	1.30
4	.70	.50	3.80	1.70
5	2.20	2.20	1.30	2.50
6	.70	1.30	1.30	1.50
7	1.30	.30	2.30	1.70
8	1.70	.80	2.00	.70
9	.50	1.30	.30	3.00
10	.20	2.70	3.30	1.70
11	1.00	3.20	2.00	1.30
12	1.30	1.80	.70	4.30
13	.70	.30	.80	2.80
14	2.50	.00	2.20	2.20
15	1.20	1.70	9.95	9.75
16	1.70	.20	.70	3.50
17	1.80	1.20	1.70	1.30
18	.30	1.70	.50	1.80
19	2.30	1.20	1.30	2.20
20	.70	1.70	3.30	1.50

[a]Word Demons
[b]Visual Memory
[c]Structural Analysis
[d]Phonetic Analysis

TABLE III

ANALYSIS OF VARIANCE FOR SPELLING TEST SCORES

F table for two way classification Analysis of Variance

Source	ssq	df	msq	F
among subtest treatments	44.01	3	14.67	5.37
among subjects treatments	75.03	19	3.95	1.45
interaction	155.64	57	2.73	1.58
within blocks	553.00	320	1.73	
total	827.00	399		

falls near the boundary of a selected region of significance. The computed B' from this formula allowed the acceptance of the null hypothesis at the five per cent level of significance. Therefore, it was concluded that there was no significant difference among the cell variances in the universe.

III. ANALYSIS OF VARIANCE

The following hypotheses tests were those tested by the analysis of variance procedure at the five per cent level of significance.

Hypothesis: That all means of blocks were equal.
This hypothesis was rejected. Therefore, this means that all means of the cells or blocks were not equal to each other or that there was a statistically significant difference between the means of the blocks or cells.

Hypothesis: The significance of the interaction.
This hypothesis was rejected. Therefore, this means that all cell or block components were not equal to zero or that there was a statistically significant interaction.

Hypothesis: The means of the subtests were equal.
This hypothesis was rejected. Therefore, this means that we must reject the hypothesis that the means of the subtests were equal or that there was a statistically significant difference between the subtest means.

Hypothesis: The means of the subjects were equal.
This hypothesis was accepted. Therefore, this means that we must accept the hypothesis that the means of the subjects were equal or that there is not a statistically significant difference between the subjects means.

IV. PEARSON PRODUCT MOMENT CORRELATIONS

The correlation coefficients between the subtests ranged from -.10 to .29. The correlation matrix for the Pearson Product Moment correlation coefficients is entered in Table IV, page 31. The critical value is shown at the bottom of the table.[1] If the computed Pearson Product Moment correlation coefficient exceeds the critical value, one is to reject at the five per cent level of significance the null hypothesis that the populations have zero correlation.

It was seen that the correlation coefficients did not exceed, in any instance, the critical value of .444.[2] Therefore, it was concluded that the four subtests were not significantly correlated with each other. This also implies that the subtests were four relatively independent measures of spelling ability, viz., visual memory, phonetic analysis, structural analysis, and word demons.

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[1] Crow, E. L., Davis, F. A., and Maxfield, M. W. Statistical Manual. New York: Dover Publications, Inc., 1960, p. 159.

[2] Ibid., p. 241.

TABLE IV

CORRELATION COEFFICIENTS[a] AMONG THE SUBTESTS

CORRELATION MATRIX				
SUBTESTS				
	VD	VM	SA	PA
VD	1.00	.29	-.14	-.10
VM		1.00	.11	.20
SA			1.00	.23
PA				1.00

[a]Critical value for correlation coefficient at the .05 is .444 (N = 20).

[b]Subtest for Word Demons
[c]Subtest for Visual Memory
[d]Subtest fro Structural Analysis
[e]Subtest for Phonetic Analysis

V. DUNCAN'S MULTIPLE RANGE TEST

Duncan's Multiple Range Test[3] was computed using the four subtests i.e., their means. The computations in this test are reported on page 33. The purpose of this test was to find the relation among the four subtests in terms of their difficulty levels. Subtests Word Demons, Phonetic Analysis, and Structural Analysis did not differ significantly as to their difficulty level, but all of them differed from Visual Memory. The subtest for visual memory was the easiest of the four subtest.

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[3]McGuigan, F. S. Experimental Psychology. New Jersey: Prentice-Hall, Inc., 1960, pp. 173 - 8.

TABLE V

DUNCAN'S MULTIPLE RANGE TEST[1]

Values of r_p and R_p for 4 groups with 60 df			
p	2	3	4
S_e [(a)]	3.87	3.87	3.87
r_p [(b)]	2.82	2.96	3.06
R_p [(c)]	2.43	2.56	2.65

(a) S_e = Square root of the error variance

(b) r_p = "least significant standardized ranges"

(c) R_p = "least significant ranges"

Subtests and their means			
WD[a]	PA[b]	SA[c]	VM[d]
13.75	14.70	15.70	18.20

[a]Word Demons
[b]Phonetic Anslysis
[c]Structural Analysis
[d]Visual Memory

Subtraction of Subtest Means	
WD - VM = 4.45	PA - VM = 3.50
WD - SA = 1.45	PA - SA = 1.00
WD - PA = .95	SA - VM = 2.50

[1]McGuigan, F. S. Experimental Psychology. New Jersey: Prentice-Hall, Inc., 1960, pp. 173-8.

CHAPTER IV

SUMMARY

The construction of the four subtests employed in this study was initiated by the Reading Laboratory, University of Omaha, under the direction of Dr. H. Johnston. The basic theory which promoted the construction of the subtests was that there are several hypothesized factors effecting the spelling disability of an individual. Several recognized and accepted sources were consulted (refer to the bibliography) inorder to obtain the selected data that forms each of the subtests. The major focus of concern here was to select test items which were characteristic of each hypothesized disability and construct a subtest which would offer an adequate measurement within this specific area of spelling disability.

The subjects employed in this study were a homogeneous group in relation to their spelling performance disability. All subjects were members of a remedial college English course at the University of Omaha. Each student was placed in this class because of his inability to spell according to university requirements viz., not able to successfully complete the required freshman English course.

The test for homogeneity of variance was conducted.

The null hypothesis for this test was accepted, thus there was no evidence of a significant difference among the cell variances. This finding is understandable in the light of the fact that all subjects were from a class in remedial English.

The hypothesis that the subject means were equal was also accepted. The acceptance of this null hypothesis implies that the subjects used for this experiment were relatively closely matched in their overall ability with respect to the dynamics of spelling.

The hypothesis that the means of the subtests were equal was rejected. This suggested that there was a difference in the overall performance of the subjects on the respective subtests.

The hypothesis that there was no interaction between subjects and subtests also was rejected. This meant that the pattern of subtest scores differed significantly from subject to subject. Thus this would imply that the subtests do have some degree of discriminative value even when dealing with homogeneous subjects.

None of the correlation coefficients between subtests exceeded the critical value. This implied that the four subtests were not significantly correlated with each other.

These results suggested that the four subtests were four relatively independent measures of spelling ability, viz., visual memory, phonetic analysis, structural analysis, and word demons.

From the results cited above it may be concluded that there are four relatively independent factors operative in spelling dynamics. Subjects of similar overall spelling ability do differ significantly in their scores upon each of these four hypothesized factors. Thus the results obtained from a person taking the Test of Differential Spelling Ability may be employed as a guide for appropriate tutoring and/or instruction with respect to his area or areas of spelling disability.

If further research is undertaken in the area of factors effecting the dynamics of spelling concern might be focused toward the specific disabilities incurred by learning to spell phonetically as verses learning to spell by structural usage. There has been considerable controversy in the literature for several years as to which method of teaching spelling is the most effective i.e., phonetic or structural. Yet, little has been done to systematically measure and/or diagnose what types of disabilities are incurred by either of the two methods or a combination of the two.

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APPENDIX

TABLE I

SUBJECTS' CELL SCORES

FOR EACH SUBTEST

SUBJECTS		SUBTESTS			
	Cell	I[a]	II[b]	III[c]	IV[d]
(1)	1	3	5	3	4
	2	4	5	2	3
	3	2	4	4	5
	4	3	5	3	3
	5	3	4	5	5
(2)	1	3	4	3	5
	2	5	4	0	2
	3	5	3	2	4
	4	3	3	1	4
	5	4	3	5	5
(3)	1	3	4	2	3
	2	3	5	3	3
	3	4	5	0	5
	4	5	5	4	2
	5	3	2	4	4
(4)	1	2	3	1	4
	2	3	4	0	3
	3	3	4	4	1
	4	4	4	4	2
	5	2	5	4	1
(5)	1	0	2	3	0
	2	4	3	3	3
	3	2	0	2	2
	4	2	4	1	1
	5	1	2	4	4
(6)	1	5	4	2	4
	2	4	4	3	3
	3	5	2	4	4
	4	3	3	4	3
	5	4	5	5	1
(7)	1	1	4	4	5
	2	0	5	4	4
	3	3	4	5	5
	4	2	4	1	5
	5	2	5	4	2

[a] Word Demons
[b] Visual Memory
[c] Structural Analysis
[d] Phonetic Analysis

TABLE I (continued)

SUBJECTS		SUBTESTS			
	Cell	I[a]	II[b]	III[c]	IV[d]
(8)	1	1	4	3	2
	2	2	2	4	1
	3	1	2	3	3
	4	1	4	3	2
	5	4	4	1	3
(9)	1	2	4	4	5
	2	2	5	5	5
	3	1	4	5	4
	4	3	2	5	5
	5	2	3	4	1
(10)	1	3	4	2	4
	2	2	5	1	2
	3	3	1[q]	3	3
	4	3	4	2	5
	5	3	5	5	5
(11)	1	1	3	3	3
	2	3	4	3	4
	3	1	1	3	1
	4	2	5	1	3
	5	3	1	5	2
(12)	1	3	4	3	5
	2	4	5	2	2
	3	2	2	4	0
	4	3	4	2	1
	5	5	2	3	0
(13)	1	5	4	3	0
	2	4	4	2	4
	3	4	3	3	4
	4	3	4	5	2
	5	5	5	0	2
(14)	1	1	5	3	4
	2	5	5	2	3
	3	2	5	1	1
	4	4	5	3	3
	5	3	5	5	5